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Research Notes : United States : Cytoplasm sources of soybean cultivars grown in the United States and Canada

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1) Cytoplasm sources of soybean cultivars grown in the United States and Canada.

In a recent study of cytoplasmic diversity in the soybean, made by restriction endonuclease analysis, Sisson et al. (1978) and Shoemaker et al. (1986) reported that cytoplasmic uniformity exists among currently grown soybean cultivars. Available evidence suggests that the potential cytoplasmic vulnerability in soybeans is no less than that of most other crops. The identification of cytoplasms from different sources may be one way of preventing possible future disease epidemics. Cataloging the cytoplasms of existing soybean cultivars according to source would be a first step in identifying different cytoplasms.

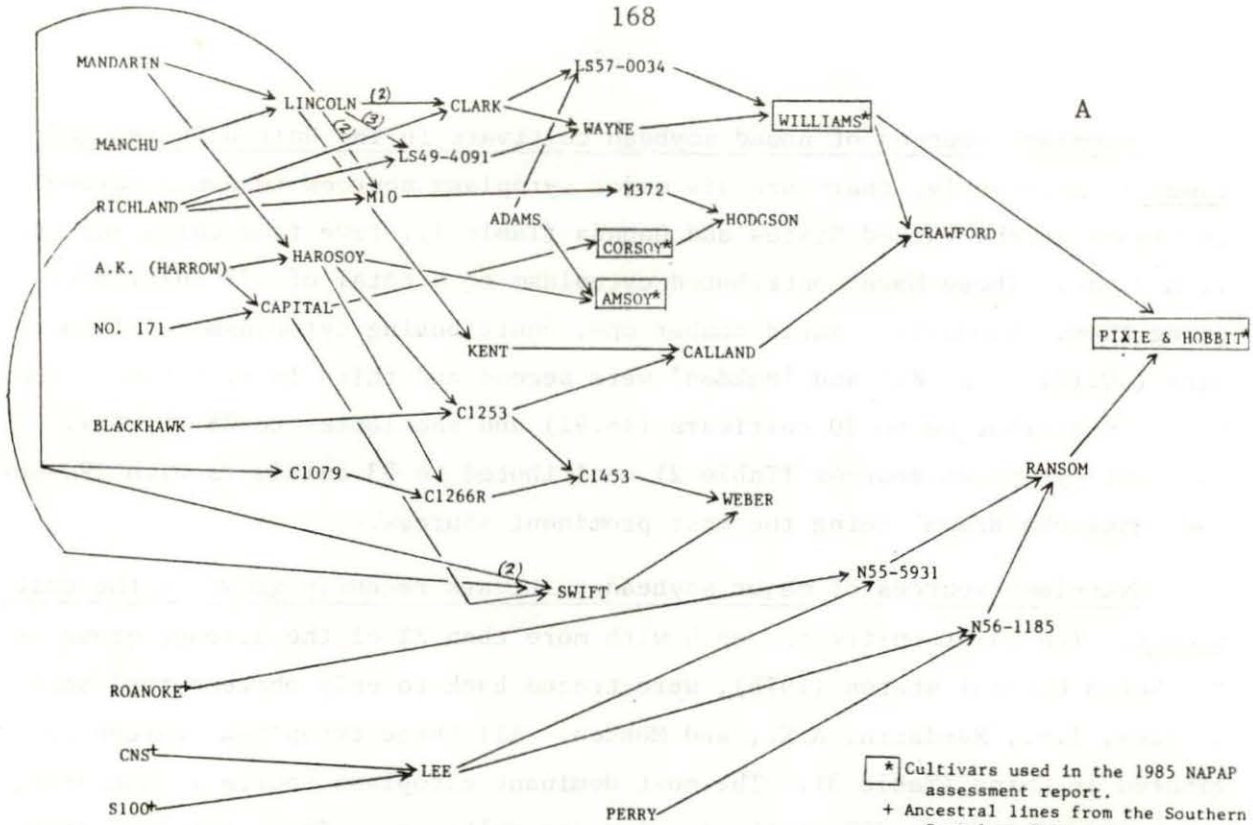
This report is a listing of sources of cytoplasms of named cultivars in the United States and Canada as determined from traceable pedigrees. Data used in our study came from three sources, as follows: (1) Pedigree of soybean cultivars released in the United States and Canada (Hymowitz et al., 1977); (2) Registration of soybean cultivars (various authors) in Crop Science (1976-1982); and (3) the Uniform Soybean Test-Northern States (Wilcox and Knapp, 1979, 1980 and 1981). Also see Delannay et al. (1983) and Specht and Williams (1984).

The cytoplasm source of each soybean cultivar was obtained by tracing back through the cultivar's pedigree to the maternal ancestor or maternal population. Cultivars that came from the same maternal ancestors or maternal populations were considered to have the same cytoplasm source. Cytoplasm sources of soybean cultivars were classified into major and minor groups according to the total number of cultivars having each source; cytoplasm sources contributing to 10 or more cultivars were included in the major groups and those contributing to less than 10 cultivars are assigned to minor groups.

Cultivars that have never been reported as female parents of crosses or populations for reselection to generate one or more new cultivars, cultivars having uncertain pedigree, and cultivars released by private companies were not covered in this study.

Cytoplasm sources of named soybean cultivars in the United States and Canada: Apparently, there are six major cytoplasm sources in named soybean cultivars in the United States and Canada (Table 1), five from China and one from Japan. These have contributed cytoplasm to a total of 177 cultivars. Among them, 'Mandarin' ranked number one, contributing cytoplasm to 71 cultivars (40.1%). 'A. K.' and 'Mukden' were second and third in importance, the former contributing to 30 cultivars (16.9%) and the latter to 28 (15.8%). The 24 minor cytoplasm sources (Table 2) contributed to 53 cultivars with 'Roanoke' and 'Manitoba Brown' being the most prominent sources.

Cytoplasm sources of major soybean cultivars recently grown in the United States: Ten major cultivars, each with more than 2% of the acreage grown in the North Central states (1978), were traced back to only three cytoplasmic sources, i.e., Mandarin, A.K., and Mukden. All three cytoplasm sources originated in China (Table 3). The most dominant cytoplasm source is Mandarin, which contributed to 70% of the total major cultivars. These results strongly demonstrate the possibility of cytoplasmic vulnerability of major soybean cultivars in the North Central states. Nine major cultivars that together contributed to about 83% of the cultivated acreage in the South Central states were traced back to 4 different cytoplasm sources (Table 4). Three cytoplasm sources came from China and one from Japan. Among the 4 sources, A. K. and 'Dunfield' each contributed to 33% of the total number of cultivars appearing to be of major importance. These results indicate that cytoplasmic vulnerability of major soybean cultivars in the South Central states may be almost as serious as that of major cultivars in the North Central states.



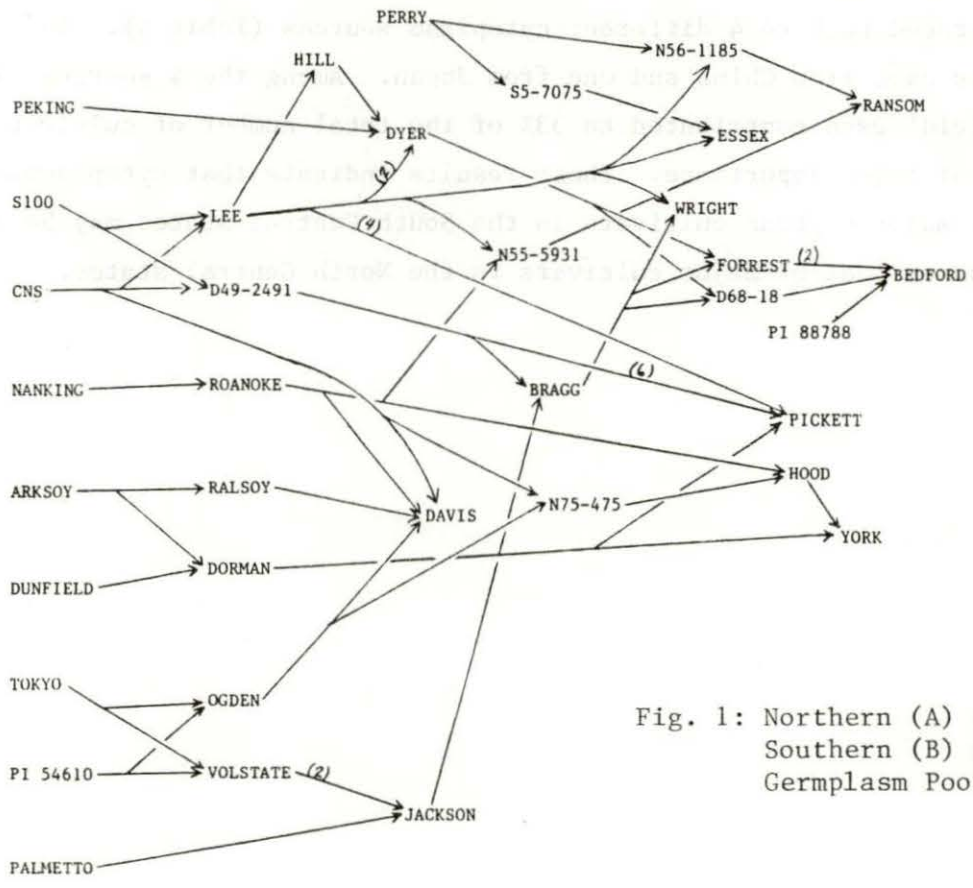


Fig. 1: Northern (A) and Southern (B) Soybean Germplasm Pools.

Table 1. Major cytoplasm sources of named soybean cultivars in the United States and Canada

Cytoplasm source [Origin]	Cultivars released		
	Number	%	Name
Mandarin (PI 36653) [NE China]	71	40.1	Aldelphia, Bonus, BSR 301, Chippewa, Chippewa 64, Clark, Clark 63, Columbus, Corsoy, Corsoy 79, Crawford, Cumberland, Cutler, Cutler 71, Desoto, Disoy, Douglas, Dunn, Elf, Ennis I, Fabulin, Fayette, Ford, Franklin, Gnome, Grant, Harcor, Hardome, Harly, Harosoy, Harosoy 63, Hodgson, Hodgson 78, Hobbit, Kent, Lincoln, Lindarin, Lindarin 63, Magna, Mandarin (Ottawa), Mandarin 507, Mead, Miles, Nebsoy, Oakland, Ottawa, Pella, Pixie, Pomona, Prize, Provar, Rampage, Renville, Roe, Shelby, Sloan, Sparks, Sprite, Swift, Traverse, Union, Vansoy, Vickery, Wayne, Weber, Wells, Wells II, Williams, Williams 79, Williams 82, Woodworth.
A.K. [China]	30	16.9	Adams, A.K. (FC 30761), A.K. (Harrow), A.K. (Kansas), Alamo, Amcor, Amsoy, Amsoy 71, Bossie, Centennial, Chief, Curtis, Essex, HP-963, Illini, Jeff, Jupiter, Jupiter-R, Kino, Lee, Lee 68, Lee 74, Mack, Maple, Oksoy, Presto, Pickett, Pickett 71, S-100, Scott, Viking.
Mukden (PI 505230) [NE China]	28	15.8	Ada, Bavender Special, Bavender Special A, Bavender Special B, Bavender Special C, Beeson, Beeson 80, Blackhawk, BSR 302, Calland, Century, Coles, Evans, Hark, Harlon, Hawkeye, Hawkeye 69, Lawrence, Madison, Merit, Monroe, Norchief, Protana, Ross, Simpson, Steele, Vinton, Vinton 81.
Manchu (PI 30593) [NE China]	18	10.2	Funman, Granger, Harman, Linman 533, Manchu (Lafayette), Manchu (Lafayette) B, Manchu (L55-143), Manchu (Madison), Manchu Hudson, Manchu Montreal, Manchu 2204, Manchu 3 Wisc., Manchu 606 Wisc., Manchukota, Mandell, Mansoy, Mingo, Scioto.
Tokyo (PI 8424) [Japan]	16	9.0	Bragg, Coker 338, Coker Hampton 266, Coker Hamptom 266A, Dortchsoy 31, Gasoy 17, Govan, Hampton, Hutton, Jackson, Majos, Ogden, Stuart, Tennessee Non-pop, Volstate, Wright.
Dunfield (PI 36846) [NE China]	14	7.9	Bay, Bedford, Carlin, Dare, Dorman, Dyer, Earlyana, Forrest, Hill, Nathan, Tracy, Tracy-M, Wabash, York.

Table 2. Minor cytoplasm sources of named soybean cultivars in the United States and Canada

Cytoplasm source	Origin	Cultivars released	
		Number	Name
Manitoba Brown	Unknown	8	Acme, Crest, Coment, McCall, Morsoy, Norman, Pagoda, Portage
Roanoke	China	7	Davis, Duocrop, Gail, Hardee, Hood, Hood 75, Ransom
Mammoth Yellow	Unknown	5	Dortchsoy 67, Hollybrook, Macoupin, Woods Yellow, Yelredo
Wilson (PI 19183)	China	4	Wilson B, Wilson 5, Wilson 5B, Wilson 6
Habaro (PI 20405)	USSR	3	Chestnut, Goldsoy, OAC 211
Korean	China	3	Anoka, Cypress No. 1, Grande.
Otootan	Taiwan	3	Avoyelles, Gatan, Tanner
Arksoy (PI 37335)	Korea	2	Ralsoy, Semmes.
Peking	China	2	Custer, Kingwa
No. 171	China	2	Capital, Clay
Willomi (PI 81044-1)	Japan	1	Willomi B
Nanda (PI 95727)	Korea	1	Yelnanda
Bansei	Japan	1	Bansei (Ames)
Clemson (PI 71569)	Japan	1	CNS
Aoda (PI 81043)	Japan	1	Verde
Cloud (PI 16790)	China	1	Sooty
Midwest (PI 6556)	China	1	Gibson
Patoka (PI 70218)	China	1	Perry
Norsoy	Unknown	1	Pridesoy 57
Haberlandt (PI 6396)	Korea	1	Hurrelbrink
Ebony (PI 6386)	Korea	1	Ilsoy
Jogun (PI 87615)	Korea	1	Jogun (Ames)
Kanro (PI 84928)	Korea	1	Kanrich
Sac (PI 80462)	Japan	1	Kim
Total		53	

Table 3. Cytoplasm sources of major[†] soybean cultivars grown in the North Central States (1978)

Cytoplasm source	Origin	Cultivars released			
		Number	%	Name	% of soybean acreage[‡]
Mandarin	China	7	70	Williams	21.8
				Corsoy	11.8
				Wayne	5.5
				Woodworth	3.2
				Wells	3.1
				Hodgson	3.0
				Cutler 71	2.0
Total Mandarin					50.4
Mukden	China	2	20	Calland	3.8
				Beeson	3.0
Total Mukden					6.8
A.K.	China	1	10	Amsoy 71	5.9
Grand Total		10	--		63.1

[†]Grown on 2% or more of the soybean acreage.

[‡]Data from Bernard (1979).

Table 4. Cytoplasm sources of major† soybean cultivars grown in the South Central States (1978)

Cytoplasm source	Origin	Cultivars released: Number	%	Name	% of soybean acreage‡
A.K.	China	3	33.3	Lee	11.2
				Pickett 71	9.8
				Essex	7.2
Total A.K.					28.2
Dunfield	China	3	33.3	Forrest	18.7
				York	3.8
				Dare	3.0
Total Dunfield					25.5
Roanoke	China	2	22.2	Davis	10.2
				Ransom	3.3
Total Roanoke					13.5
Tokyo	Japan	1	11.1	Bragg	15.7
Grand Total		9			82.9

†Grown on 3% or more of the soybean acreage.

‡Data from Bernard (1979).

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